

TYPES OF CARTILAGE

Summary & Comments

- The type of epithelial tissue that best characterizes skin is:
- Know the names of the cells found in the epidermal layer of the skin.
- Type of glands connected to hair follicles.
- Names of the parts of the nail & associated tissues

CARTILAGE

Anatomy & Physiology I

FUNCTIONS

- Structural support
- Protection
- Movement
- Mineral storage

WHAT IS CARTILAGE

- Cells/fibers in ground substance
 - consists of a dense network of collagen fibers & elastic fibers
 - embedded in chondroitin sulfate

Cartilage

- Consists of a dense network of collagen fibers and elastic fibers embedded in chondroitin sulfate.
 - Its strength is due to its collagen fibers; its resilience, to the chondroitin sulfate.
 - Chondrocytes occur with spaces called lacunae in the matrix.

Cartilage

- It is surrounded by a dense irregular connective tissue membrane called the ***perichondrium***.
- Unlike other connective tissues, cartilage has no blood vessels or nerves (except in the perichondrium).

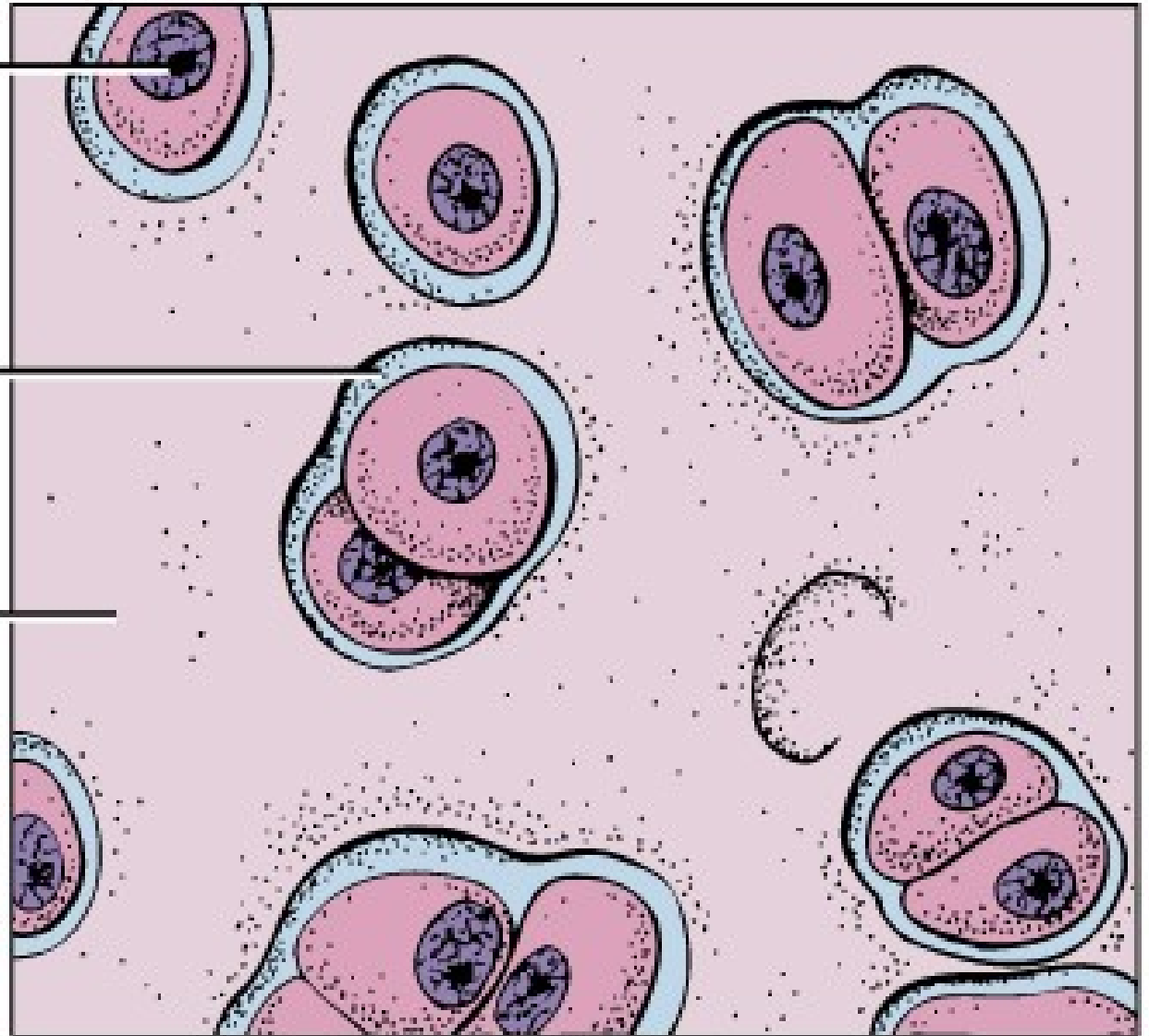
Cartilage

- There are three major types of cartilage:
 - **Hyaline cartilage** is the most abundant but weakest type of cartilage and has fine collagen fibers embedded in a gel-type matrix.
 - It affords flexibility and support and, at joints, reduces friction and absorbs shock.

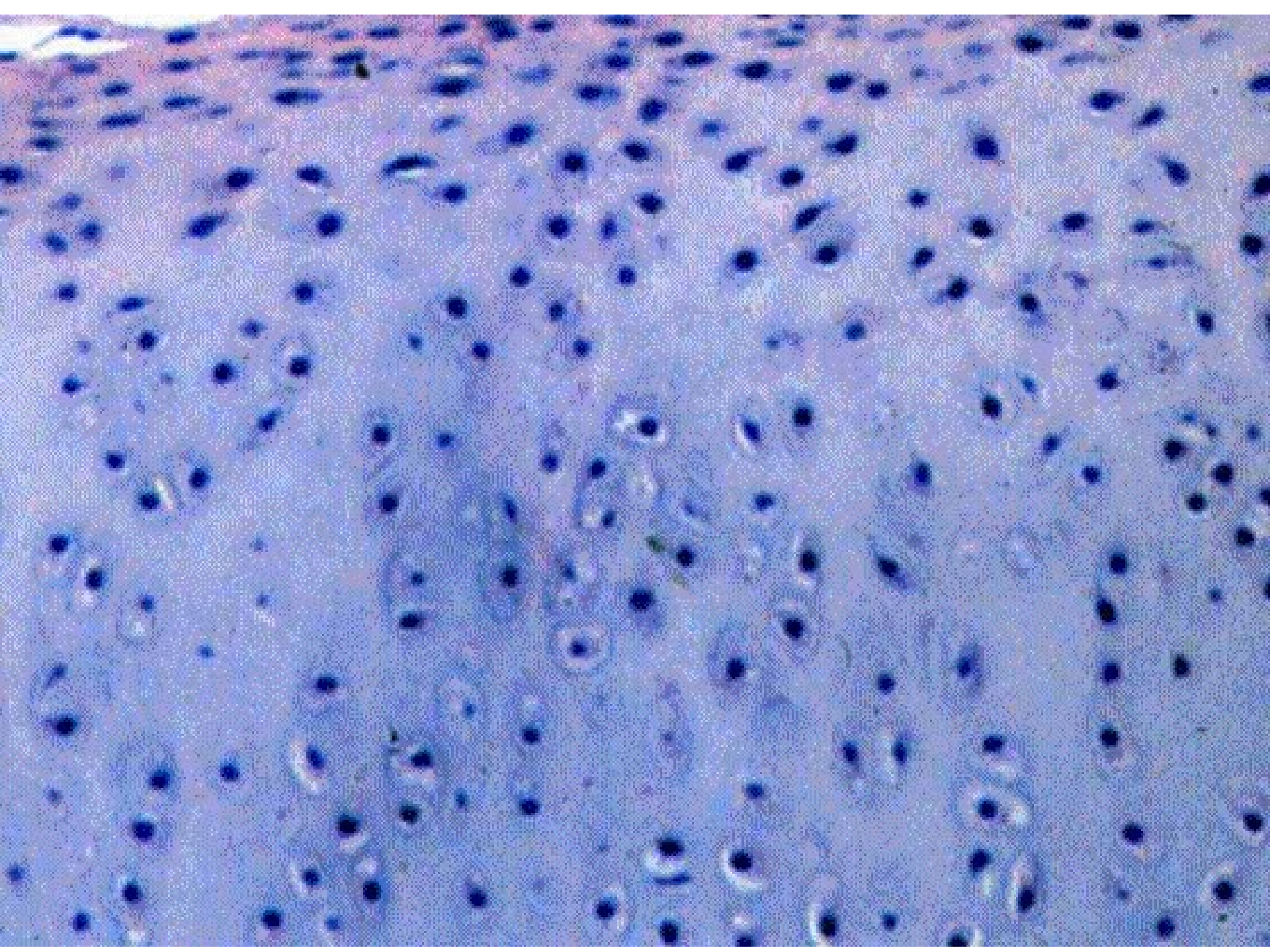
Nucleus of
chondrocyte

Lacuna
containing
chondrocyte

Ground
substance



Hyaline cartilage



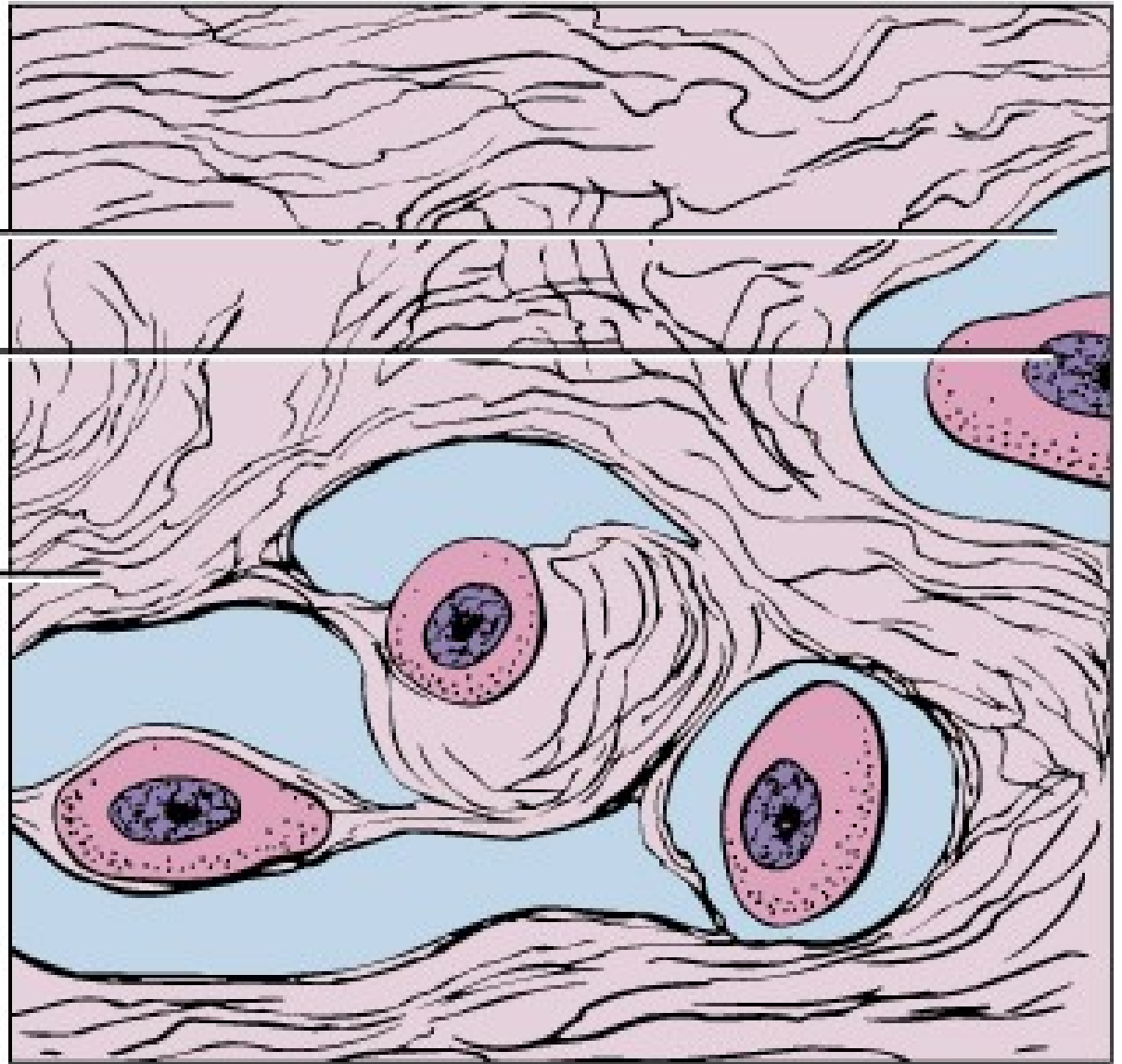
Cartilage

- ***Fibrocartilage*** contains bundles of collagen fibers in its matrix. It does not have a perichondrium. Combining strength and rigidity, it is the strongest of the three types of cartilage.

Lacuna
containing
chondrocyte

Nucleus of
chondrocyte

Collagen fiber
in ground
substance



Fibrocartilage

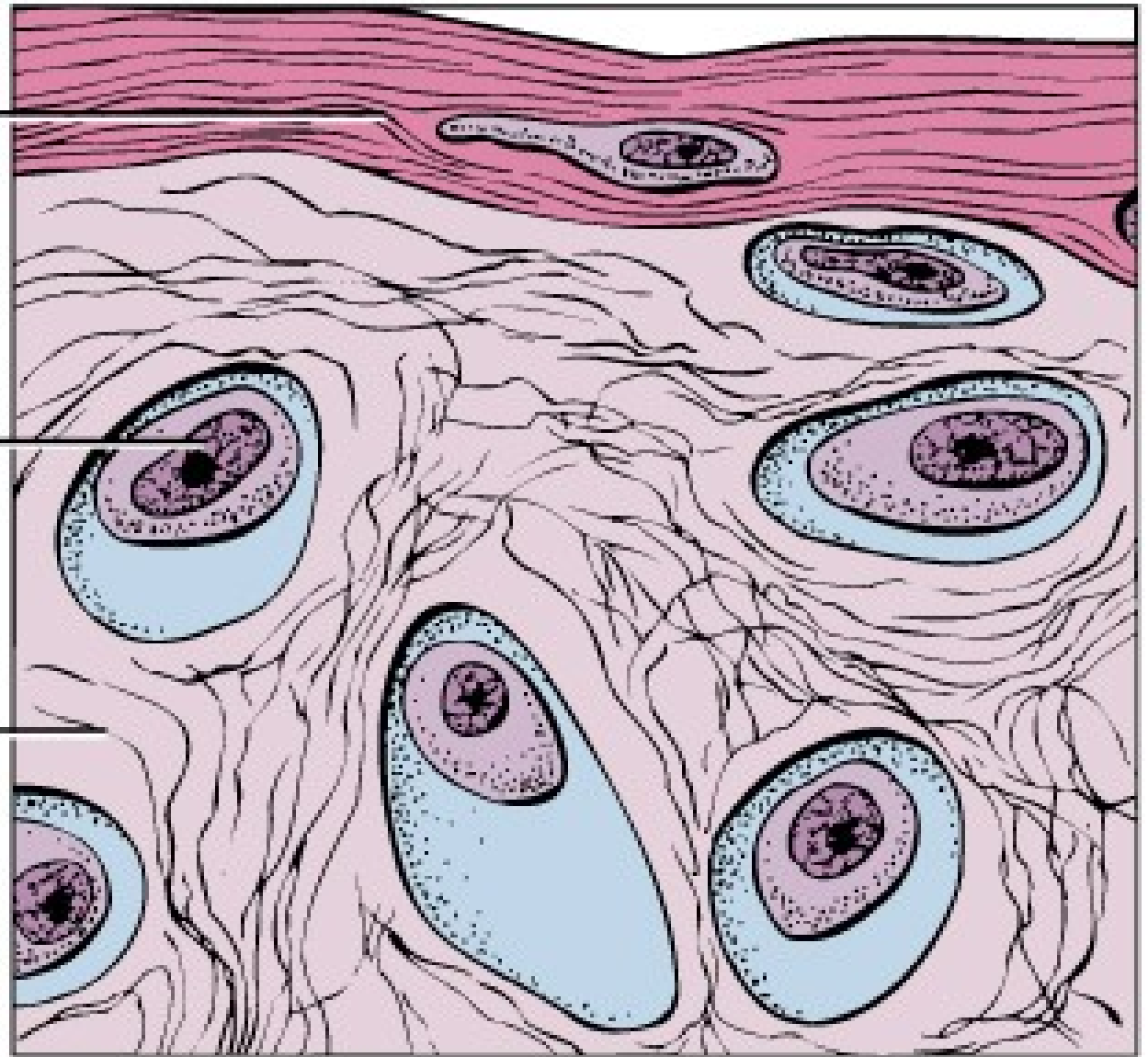
Cartilage

- ***Elastic cartilage*** contains a threadlike network of elastic fibers within the matrix. A perichondrium is present. It provides strength and elasticity and maintains the shape of certain organs.

Perichondrium

Nucleus of
chondrocyte
in lacuna

Elastic fiber
in ground
substance



Elastic cartilage

Cartilage

- The growth of cartilage is accomplished by interstitial (endogenous) growth (expansion from within) and appositional (exogenous) growth (from without).

WHAT IS CARTILAGE

- Low metabolic rate
 - Nutrition by diffusion
- Retains capacity for growth
- High tensile strength
 - Resilient
 - Elastic

CARTILAGE

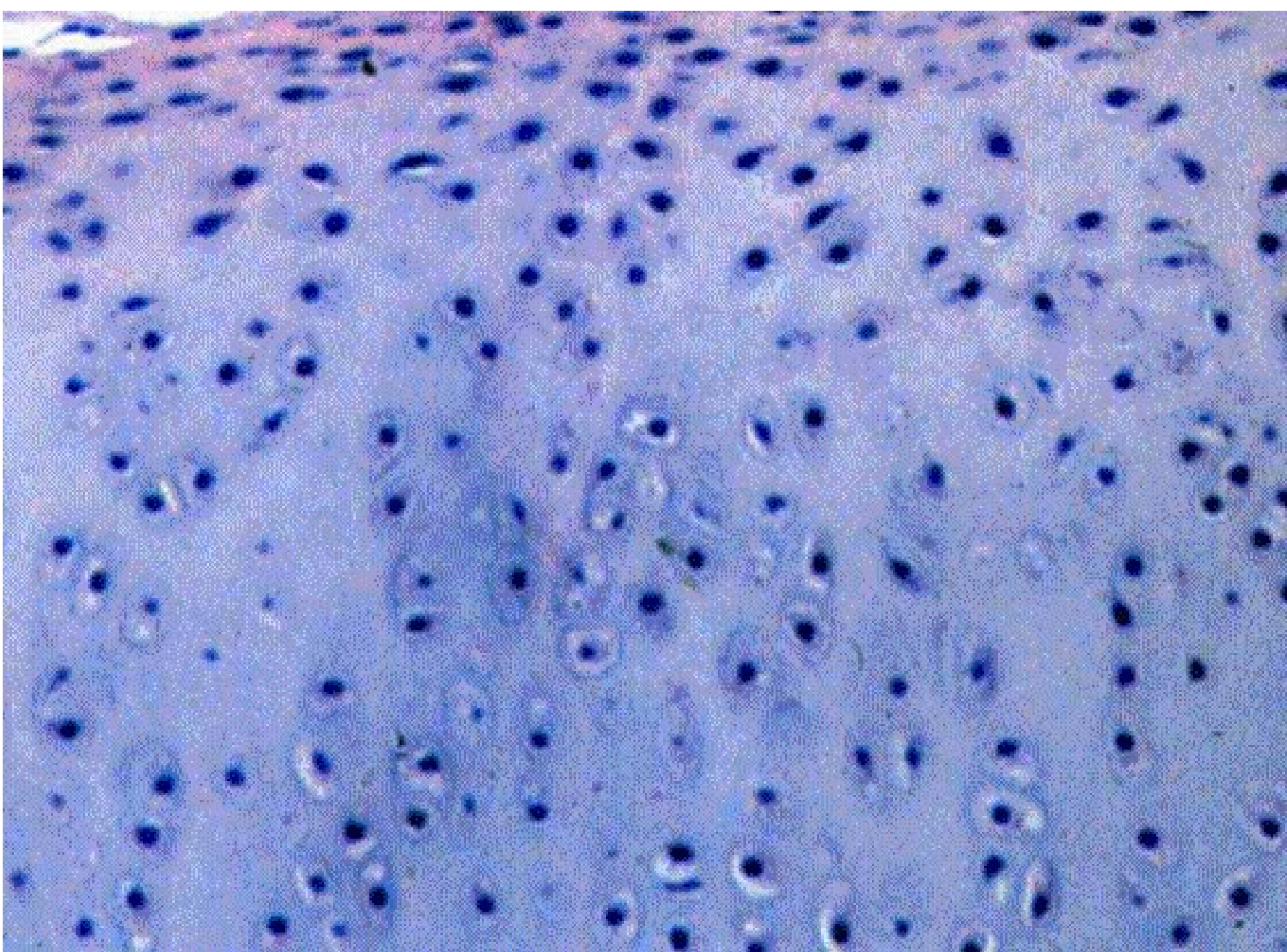
- Has perichondrial lining
 - Consists of 2 layers
 - Outer fibrous
 - Inner cellular
 - Contains blood vessels
- Absent on articular cartilage

CARTILAGE

- Cartilage has no blood vessels or nerves
- The perichondrium does

CARTILAGE CELLS

- Chondroblasts
 - Lining - **perichondrium** - a membrane of dense irregular connective tissue
 - Immature (“grows” cartilage)
- Chondrocytes
 - Mature: become surrounded
 - “Live” in lacunae
 - Divide; maintain matrix

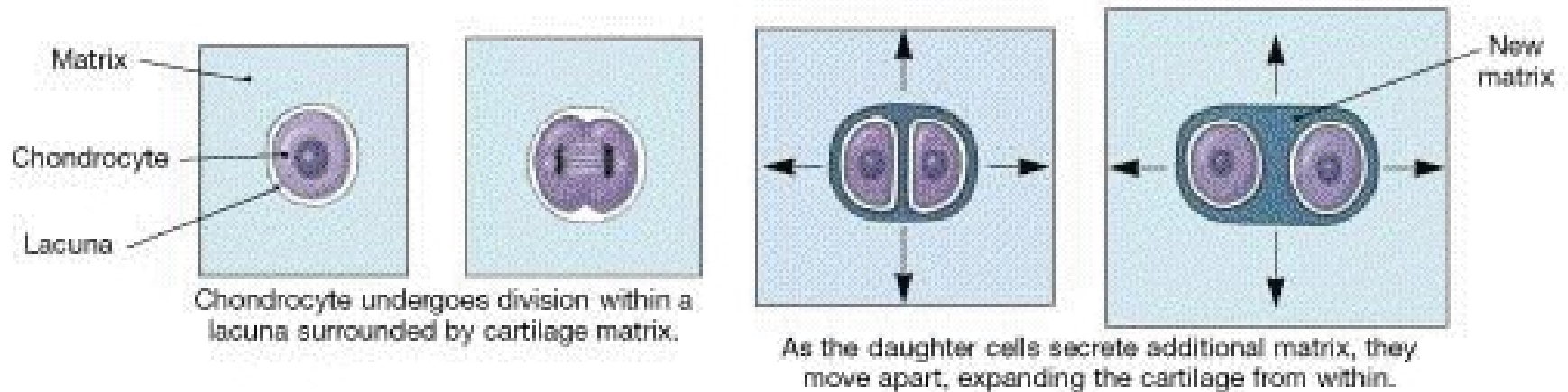


CARTILAGE MATRIX

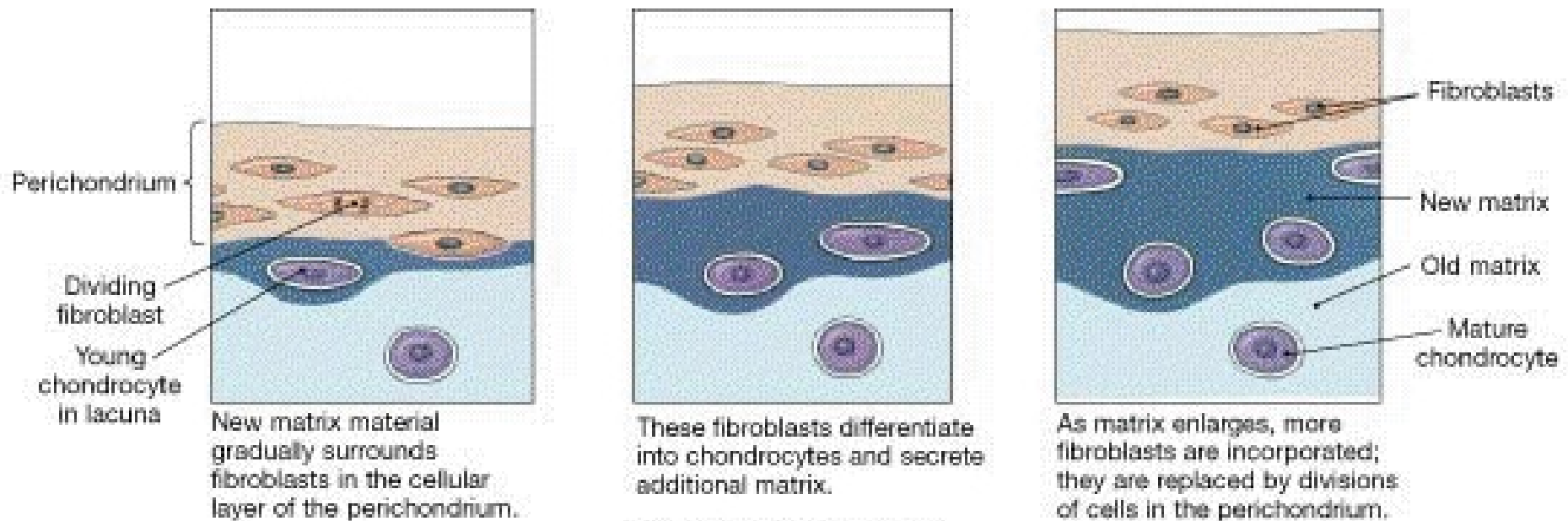
- Fibers
 - Collagen
 - Elastic
- Ground substance
 - Proteoglycans, Chondroitin sulfate
 - 80% water in matrix
 - Texture: semi-rigid, flexible

CARTILAGE GROWTH

- Interstitial (early childhood & adolescence)
 - Chondrocytes divide
 - Produce matrix
 - Daughter cells separate
- Appositional - adolescence
 - From surface perichondrium



(a) Interstitial growth



(b) Appositional growth

• **FIGURE 4-13 Formation and Growth of Cartilage.** (a) Interstitial growth. The cartilage expands from within as chondrocytes in the matrix divide, grow, and produce new matrix. (b) Appositional growth. The cartilage grows at its external surface through the differentiation of fibroblasts into chondrocytes within the cellular layer of the perichondrium.

CARTILAGE TYPES

- Hyaline cartilage
- Fibrocartilage
- Elastic cartilage

HYALINE CARTILAGE

- Most abundant
- Structure
 - Clear ground substance
 - Collagen fibers invisible
- Locations
 - Junction of ribs to sternum
 - Nasal area; trachea
 - Articular surfaces of joints

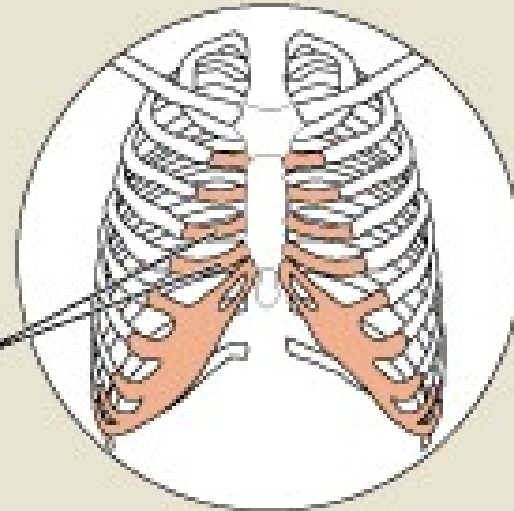
(g) Hyaline cartilage

Description: Amorphous but firm matrix; collagen fibers form an imperceptible network; chondroblasts produce the matrix and when mature (chondrocytes) lie in lacunae.

Function: Supports and reinforces; has resilient cushioning properties; resists compressive stress.

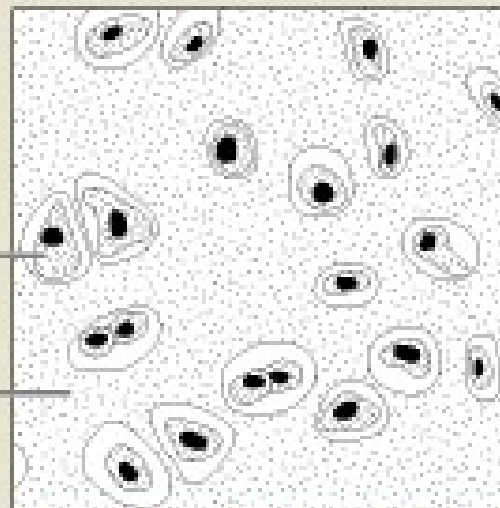
Location: Forms most of the embryonic skeleton; covers the ends of long bones in joint cavities; forms costal cartilages of the ribs; cartilages of the nose, trachea, and larynx.

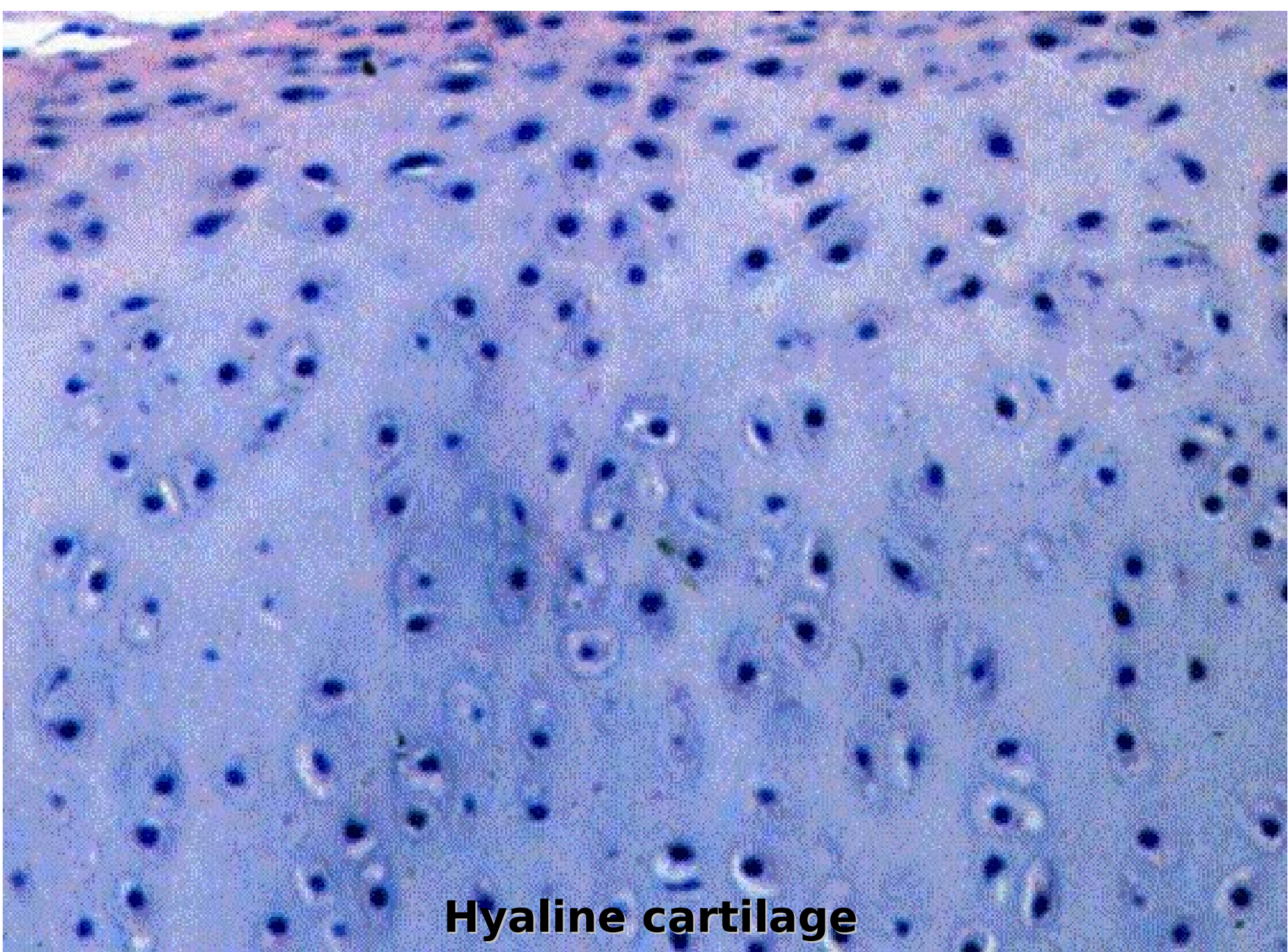
Costal
cartilages



Chondrocyte
in lacuna

Matrix





Hyaline cartilage

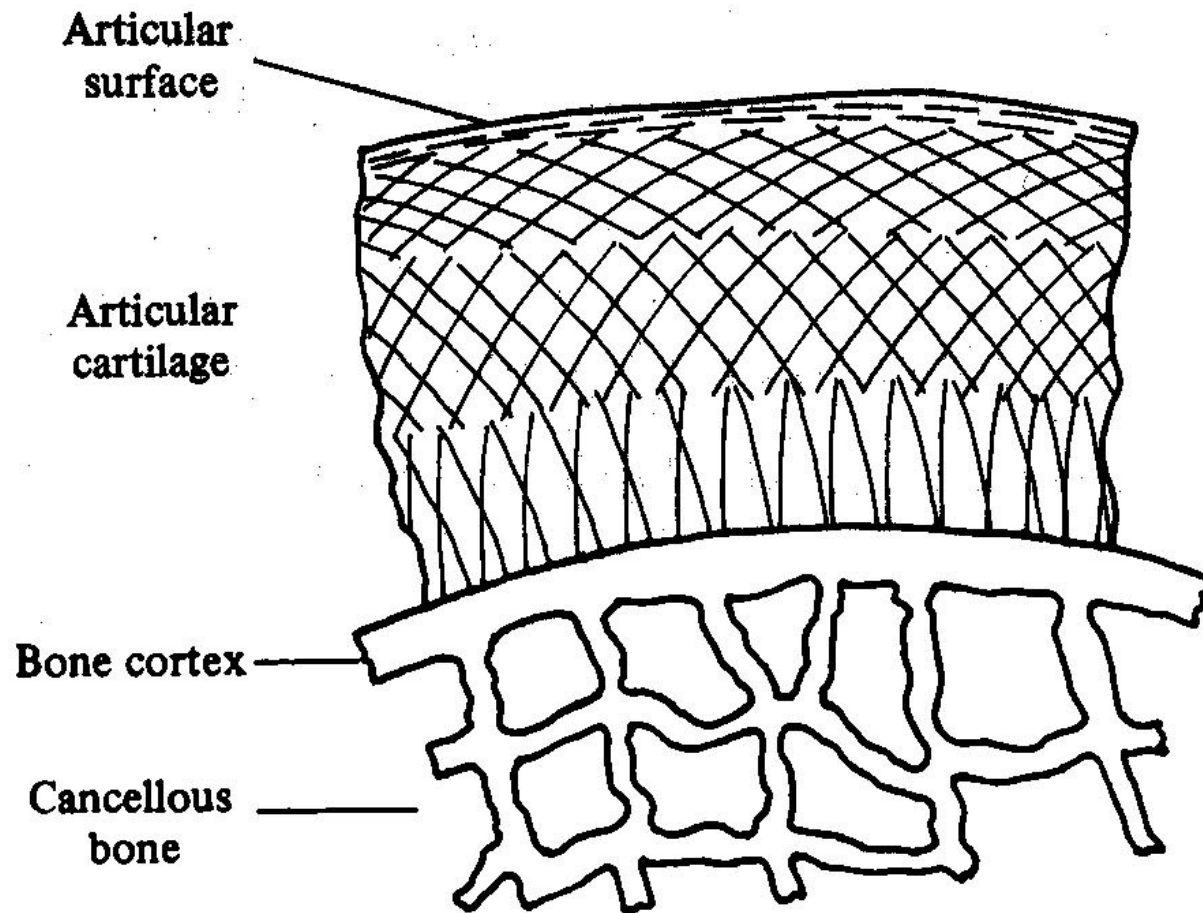


Fig. 2. A cross-sectional view of a portion of articular cartilage in place on cancellous bone, showing in a greatly simplified form the dominant directions of the collagen fibres in the different zones of cartilage.

FIBROCARILAGE

- High tensile strength
- Perichondrium poorly defined
- Collagen fibers more visible
- Locations
 - Pubic symphysis
 - Intervertebral disks
 - Knee joint
 - Clavicle to manubrium

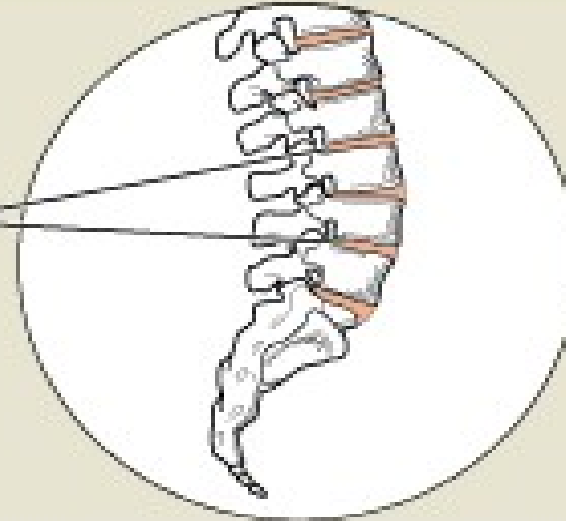
(i) Fibrocartilage

Description: Matrix similar but less firm than in hyaline cartilage; thick collagen fibers predominate.

Function: Tensile strength with the ability to absorb compressive shock.

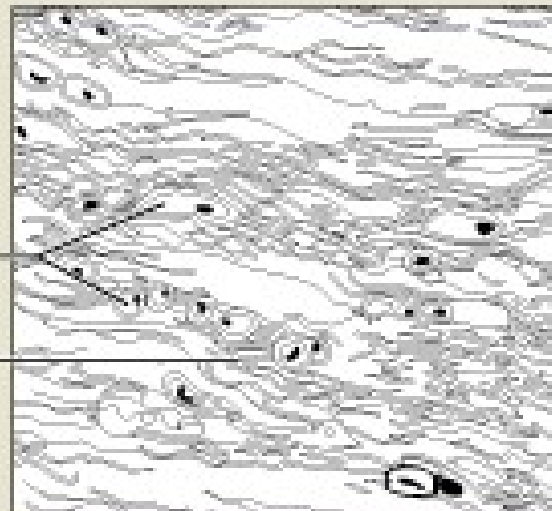
Location: Intervertebral discs; pubic symphysis; discs of knee joint.

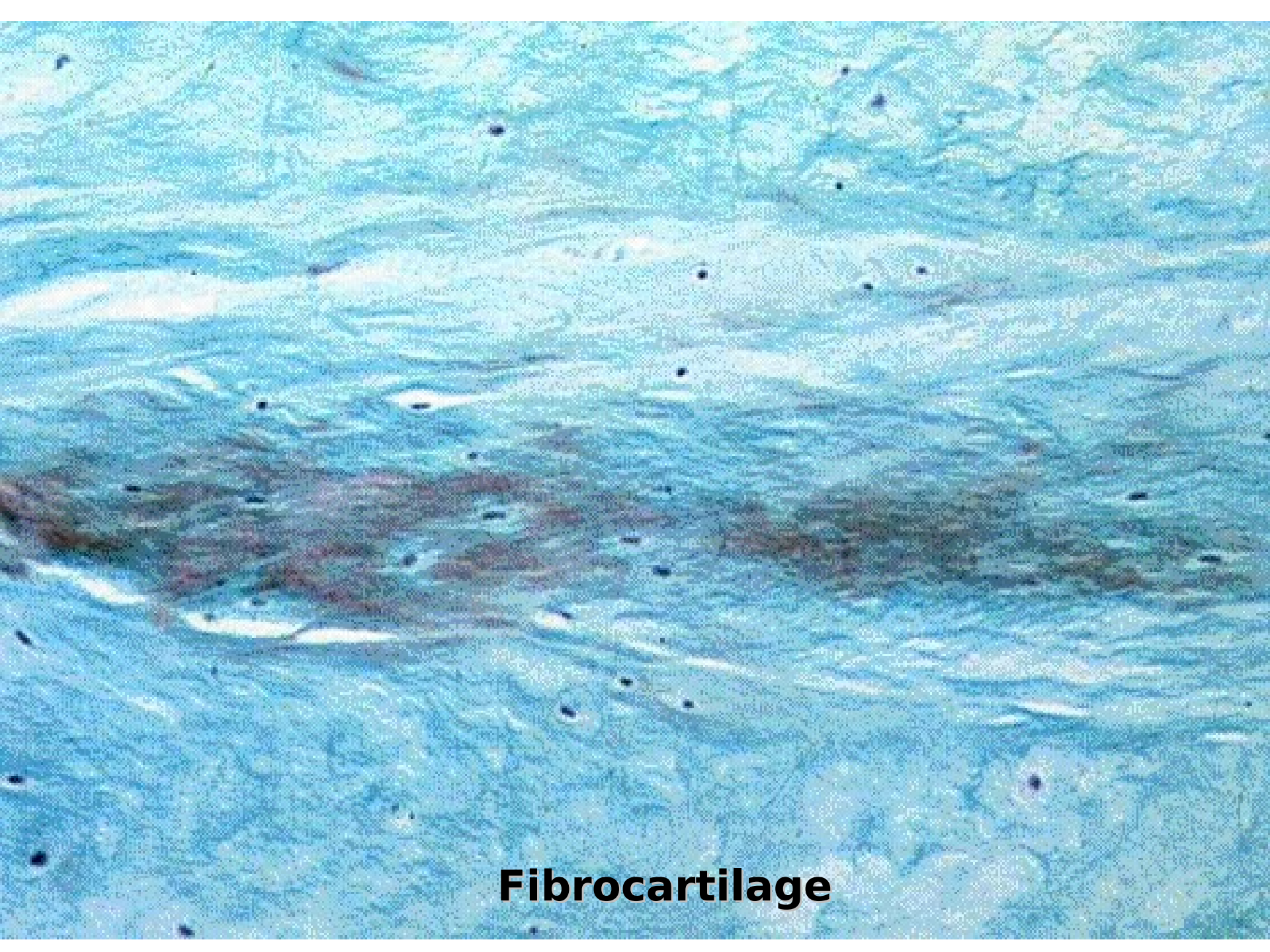
Intervertebral
discs



Chondrocytes
in lacunae

Collagen
fiber





Fibrocartilage

ELASTIC CARTILAGE

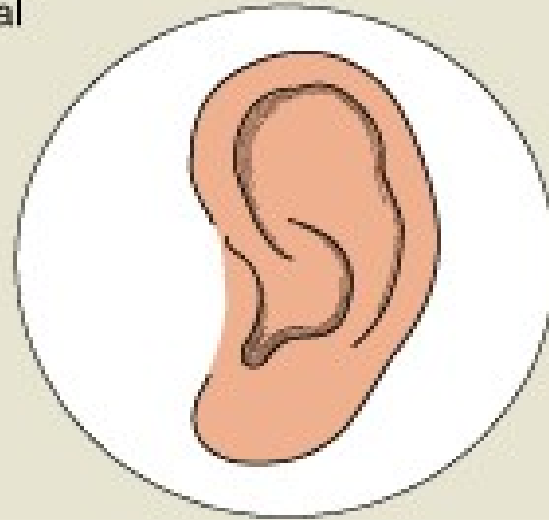
- Fiber network through- out the ground substance
- Locations
 - Epiglottis
 - External ear
 - Auditory tube
 - Areas of larynx

(h) Elastic cartilage

Description: Similar to hyaline cartilage, but more elastic fibers in matrix.

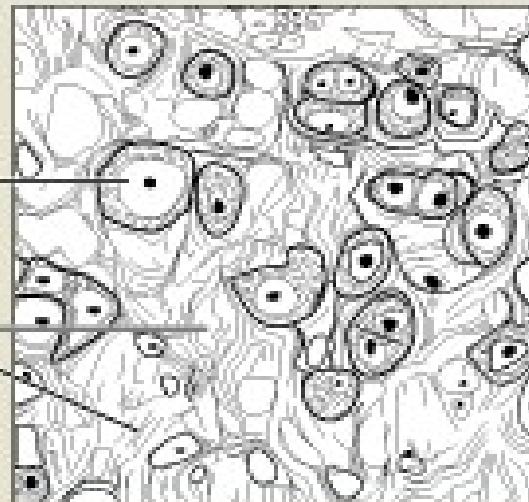
Function: Maintains the shape of a structure while allowing great flexibility.

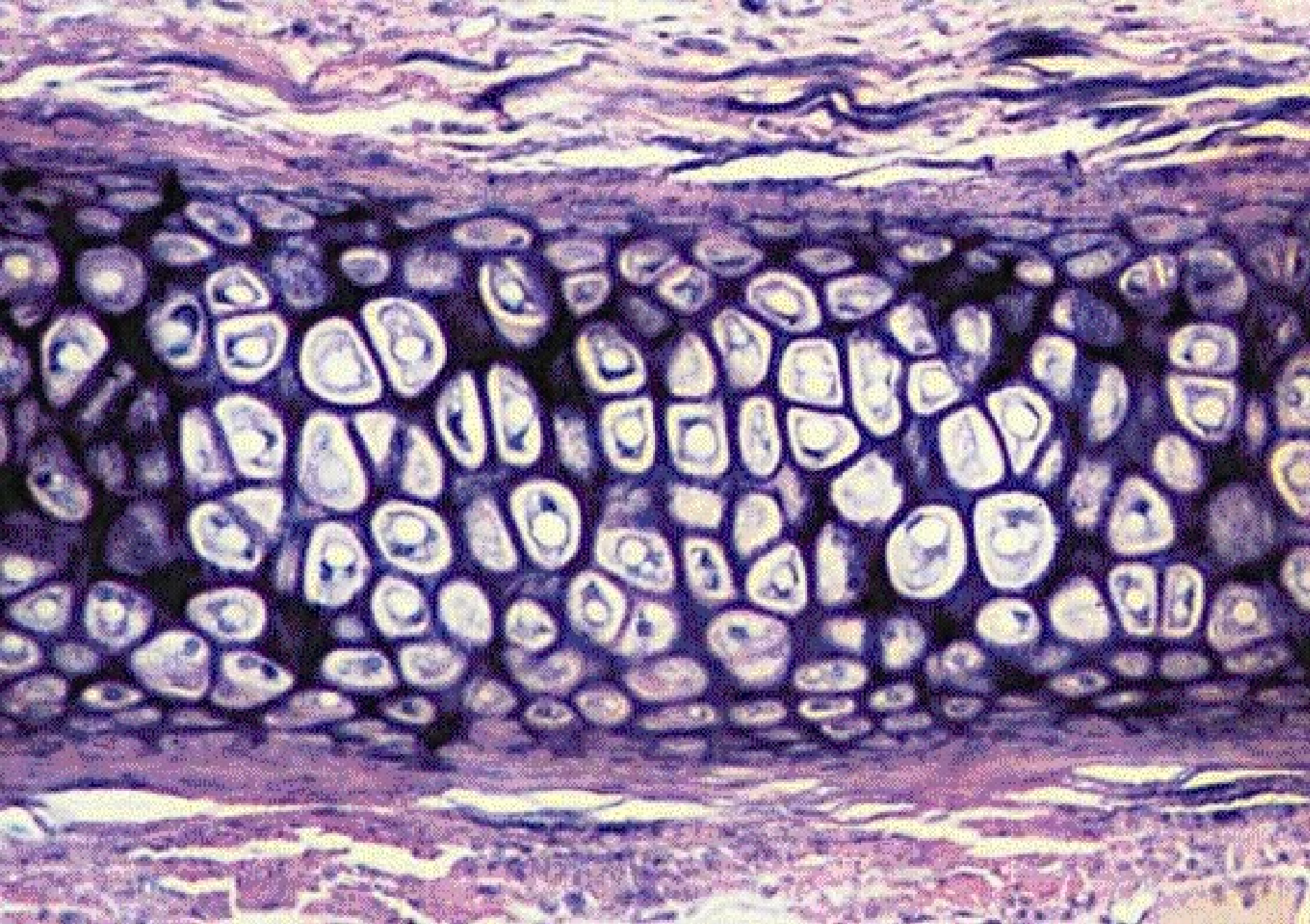
Location: Supports the external ear (pinna); epiglottis.



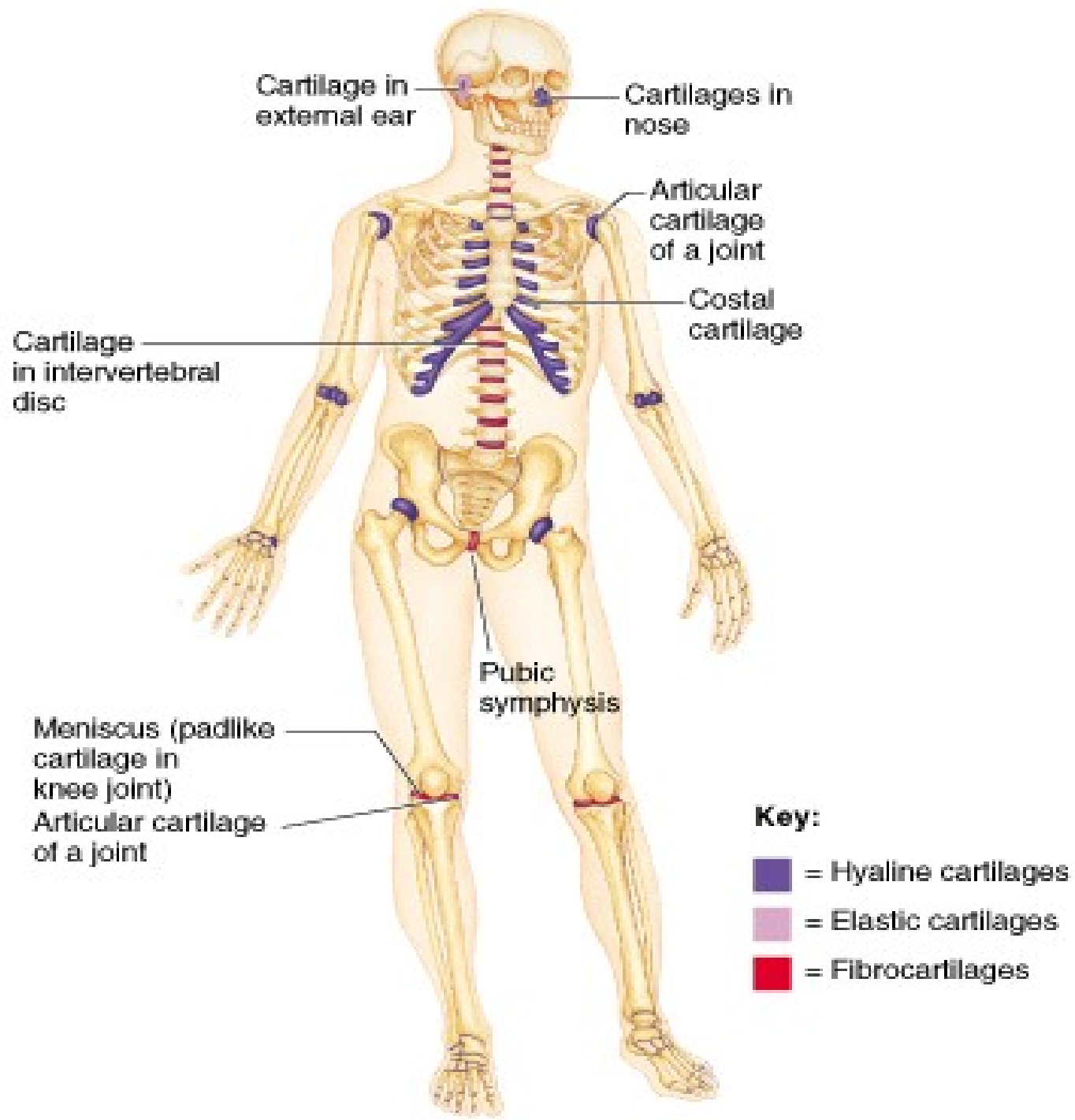
Chondrocyte
in lacuna

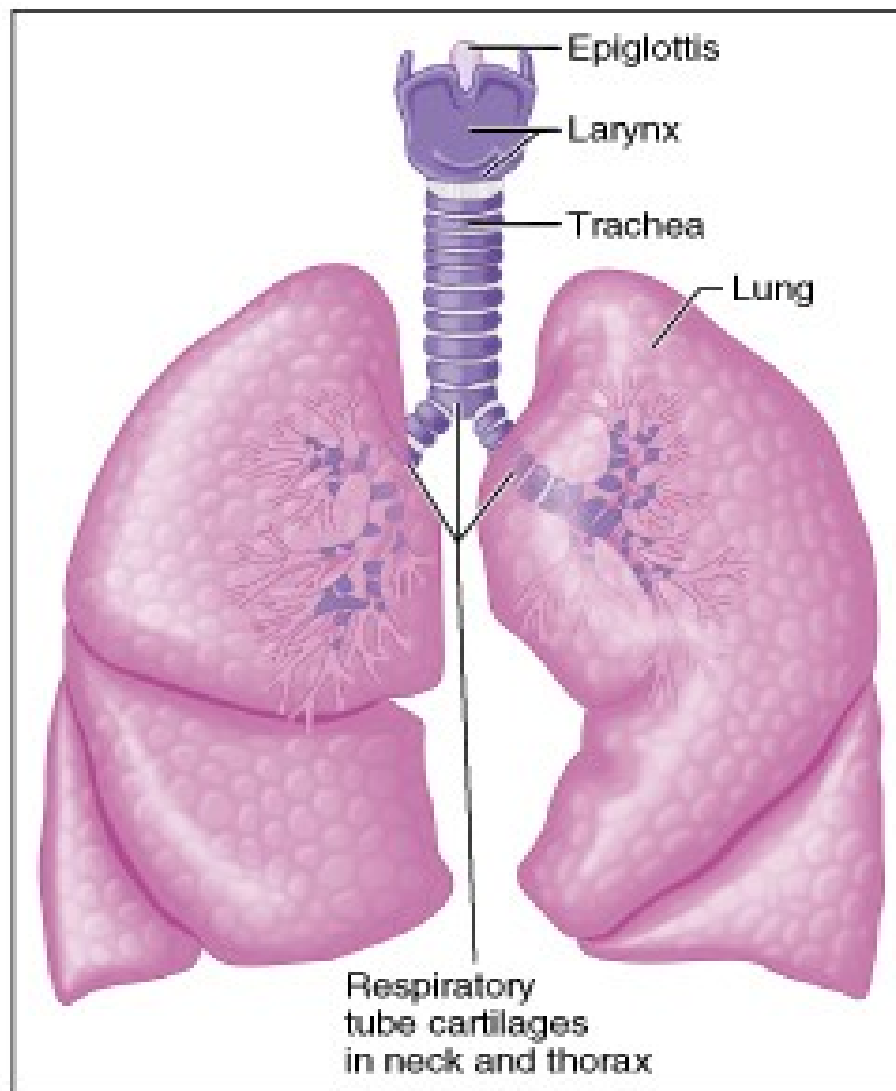
Elastic
fibers





Elastic cartilage





Key:

- = Hyaline cartilages
- = Elastic cartilages
- = Fibrocartilages

REPAIR

- From perichondrium
- Articular (hyaline) cartilage **lacks** a perichondrium and thus repairs poorly

QUESTIONS

